The leucistic character of this individual is well shown in the photographs, but in addition there are several points of especial interest. One of these is the marked accentuation of the head markings, particularly the white lines at the base of the bill, which almost meet in the mid-line of the forehead; these same lines run downwards and backwards below the eyes, measuring approximately 2 mm. to 2.5 mm. wide and terminating on either side posteriorly in broad fan-shaped markings approximately 11 mm. broad x 17 mm. long. In a series of thirty adult drakes of this species examined no similar variation, nor even tendency, was found.

Since the extent of the leucism is well shown in the photographs further detailed description is unnecessary. However, another curious feature this bird presents is what appears to be a degree of melanism affecting the specula, for these entirely lack the brilliant iridescent green of the normal bird and have become dull sooty-bronze; a similar change has affected the green of the sides of the head; the nuchal tuft, however, remains unaffected.

The measurements fall within the normal range for drakes of this species.

It should be noted that the changes described in the wing specula and of the sides of the head do not show in black and white prints; another point it is necessary to stress is that the smallest primary coverts are in fact *very* pale fawn-grey: this can be seen if this area in the lateral view is closely scrutinised, otherwise it could be thought to be white.

Acknowledgements

My sincere thanks are due to Professor K. H. Voous for the loan of this specimen and for permission to publish this note; also to Dr. Pamela Harrison for the photographs.

Notes on some specimens mainly from Aldabra

by C. W. Benson

Received 13th August, 1962

Thanks to the kindness of Drs. A. Wetmore and Philip S. Humphrey, and to generous assistance from the Frank M. Chapman Memorial Fund, through Dr. D. Amadon, I have been able to study some of the specimens collected by Dr. W. L. Abbott on Aldabra Island, reported on by Ridgway (1895). The following notes are based on material in the United States National Museum except as otherwise indicated.

(1) *Eurystomus glaucurus:* Ridgway (1895: 534) records a specimen of *E. g. glaucurus* (Müller), 10th December. It is in adult dress, with wing 194 mm. There is another adult in the American Museum of Natural History, collected by F. R. Mortimer, 24th December, 1904, labelled "Ile Piquart, Aladabra. Migratory bird. Shot by mistake.", wing 196 mm. Also in the American Museum is an immature specimen, collected by Krishnasamy Naidoo, on Anjouan, in the Comoros, 10th April, 1907, wing 192 mm., and not mentioned by Benson (1960: 55).

(2) *Tyto alba:* Although not mentioned from Aldabra by Sclater (1924) or by Peters (*Check-list of the Birds of the World*, 4, 1940), Ridgway (1895: 533) records four specimens (under the name *Strix flammea*), but had to leave the subspecies indeterminate for lack of comparative material. Compared to 10 African specimens, three of these four are rather paler

on the upper side. On the under side, all four Aldabra specimens are white, though one has a slight wash of rufous. Five of the African specimens are quite strongly washed with rufous, though the remainder lack any such wash. Another male from Aldabra, dated 27th August, 1906, in the American Museum, is markedly rufous below, while on the upper side it can be matched with various individual specimens from both Africa and Madagascar. On colour I can see no justification for separating the five Aldabra specimens. They have wing 297, 298, 298, 298, 300 mm. Thus, reference Benson (1960: 59), like specimens from Madagascar and the Comoros, they average rather larger than those from Africa, though there is so much overlap that all are best assigned to the African *T. a. affinis* (Blyth). Four specimens from Anjouan, Comoros, in the American Museum, not included in Benson's figures, have wing 306, 307, 307, 308 mm.; likewise seven from Madagascar 293, 297, 298, 299, 303, 313, 315 mm.

(3) *Phedina borbonica:* Ridgway (1895: 535) records a specimen collected on 19th November, but could not decide whether it was a *P. b. borbonica* (Gmelin) or *P. b. madagascariensis* Hartlaub, having only descriptions of the differences available. No reference is made to this record in Sclater (1930) or Mayr & Greenway (1960). I have compared the specimen with a series of 29 of *P. b. madagascariensis* in the American Museum, to which I consider it should be attributed, as indeed is much the most likely on geographical grounds. It is true that it differs in having the forehead, lores and chin uniform dark brown, and the under tail-coverts brown rather than white, but these differences would appear to be due to staining, probably in the process of skinning. In other respects it agrees well with specimens in worn dress (as it is), those in fresh dress being greyish in tone on the upper side. In the British Museum I have compared four specimens of *P. b. borbonica* from Mauritius and Re-union with 31 of *P. b. madagascariensis* from Madagascar, and three from Pemba Island and Lake Chilwa, Nyasaland. *P. b. borbonica* differs from *P. b. madagascariensis* in being much darker above, with the dark shaft-streaks hardly apparent. On the under side, the streaks on the chin to abdomen are margined with pale brown rather than white, resulting in a more dingy appearance. The feathers of the under tail-coverts are brown with white tips, instead of wholly white, except that dark shaft-streaks are apparent in both forms. The specimens of *P. b. borbonica* have wing 110, 110, 115, 121 mm., while 63 of *P. b. madagascariensis* measure 108–124, average 114.9 mm. The Aldabra specimen has wing 112 mm. Presumably it had been bred in Madagascar.

(4) *Riparia riparia: R. r. riparia* (Linné) is not recorded from any island in the western Indian Ocean in Sclater (1930) or Mayr & Greenway (1960). However, Rand (1936: 427) records a specimen from Lac Iotry, Madagascar. It is in the American Museum, and is dated 11th December, 1929. Ridgway (1895: 526, 536) records two specimens, under the name *Clivicola riparia*, respectively from Gloriosa Island, 29th January, and Aldabra, 2nd December. All three specimens appear to be *R. r. riparia.* Ridgway quotes Abbott as having seen several on Gloriosa, though it was not common. Both Abbott's specimens, like that of *Phedina borbonica*, seem to have been stained while skinning. The Gloriosa specimen has blackening on the chin, the Aldabra specimen dark brown on the chin and throat, so

that only a little white is apparent on the lower throat, adjacent to the brown chest-band. Ridgway (1895: 534, 535) also records a specimen each of two other palaearctic migrants, from Ile Picard, Aldabra, in December, *Motacilla campestris* Pallas and *Micropus apus* (Linné). Unfortunately I was unaware of this until after I had left the United States National Museum.

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The post-ocular green stripe as a plumage character of the Anatinae

by C. J. O. Harrison

Received 20th July, 1962

INTRODUCTION

In recent years a number of variant and hybrid ducks have been described, and the plumage characters discussed in relation to the phylogeny of the species concerned. In the present paper an attempt has been made to review such a character as it appears in normal birds and hybrids throughout a group of species—in this case a subfamily. It is considered that such an examination is likely to give a more accurate assessment of the value of such a character as an indicator of phylogeny than can be achieved by a study of only a few species. The reference numbers given for some of the hybrids refer to specimens in the collection of the British Museum (Natural History).

DESCRIPTION

When the skin of a hybrid duck, *Anas platyrhynchos* x *A. strepera* was examined, it was observed that the head showed a green post-ocular stripe on a chestnut-brown background, very like that of the Common Teal, *Anas crecca*, this pattern being absent from the plumage of the parent species. Subsequently a study was made of the plumage patterns of the Anatinae to record how frequently this green stripe recurred as an element in the head pattern. In its most marked form this stripe may encircle the eye, and curves away downwards to the nape. In some cases it is less apparent and may not reach the eye, but commences a little posterior to it. In the following list of its occurrence in various species and hybrids the taxonomic arrangement proposed by Delacour (1954–59) has been used.

The stripe is present in the following birds:—

ANATINI

Common Teal, *Anas crecca*, (♂) Well-marked stripe, emphasised by a buff border.

Baikal Teal, *A. formosa*, (♂) Well-marked stripe, edged with white, commences posterior to the eye and is broadest at the nape.

Falcated Teal, *A. falcata*, (♂) A broad iridescent green stripe on an iridescent purple head.

European Wigeon, *A. penelope*, (♂) Vestigial remnant, marked only by a few green feathers near the upper posterior edge of the ear-coverts.

American Wigeon, *A. americana*, (♂) Ill-defined stripe, commencing posterior to the eye, narrow and mixed with black feathers.

Chiloë Wigeon, *A. sibilatrix*, Stripe present but not obvious from all angles, tends to merge with the purple gloss of the neck.

Pintail, *A. acuta*, (♂) There is a small area of lilac iridescence towards the posteoirr edge of the brown plumage, on either side of the head, which, when viewed from behind, shows green.

Blue-winged Teal, *A. discors*, (♂) The sides of the head are bluish-green and, viewed from behind, show an ill-defined green stripe.

Hybrids

Mallard x Gadwall, *A. platyrhynchos* x *A. strepera*, (B. M. 1905.11.20.1) In this the sides of the head are light chestnut-brown, the crown is black, and the lores are blackish. A green stripe appears a little posterior to the eye and continues to the nape.

Another specimen (B. M. 1905.2.24.1012) is similar but with a more distinct, teal-like stripe, the stripes uniting at the nape to continue as a green area encircling the lower neck.

(*A. platyrhynchos* x *A. strepera*) x *A. strepera*. This has the crown chestnut with blackish barring, ear-coverts golden-buff, and a bronze-green iridescent stripe from behind the eye to the nape.

Chilean Teal x Mallard, *A. flavirostris* x *A. platyrhynchos*. Crown and checks blackish freckled buff, throat black, faint greenish stripe visible behind eye.

Spot-billed Duck x Mallard, *A. poecilorhyncha* x *A. platyrhynchos*, (B. M. 82.2.28.10) Cheeks buff speckled with dark brown, crown dark brown. Ill-defined green stripes similar to those of *A. americana* meeting at the nape.

Grey Duck x Pintail, *A. superciliosa* x *A. acuta*, (1924.5.31.118.) Ear-coverts buff on anterior, white on posterior, speckled with black; crown mixed black and brown; faint evidence of green stripe.

European Wigeon x Common Teal, *A. penelope* x *A. crecca*, (B. M. 1929. 8.7.2.) Very like a teal. A broad bold green stripe, with traces of a pale edge, on a light chestnut head.

European Wigeon x Pintail, *A. penelope* x *A. acuta*, (B. M. 1913.3.1.1.) Cheeks pale cream divided by a vertical band of black below the eye (''Bimaculated'', see Harrison, J. 1953, Sage 1960) Throat black, crown chestnut, distinct green stripe from eye to nape.

Another specimen (B. M. 1905.1.11.1.) This is similar but without the dark band on the cheek, and with a blacker throat and buffer crown.

From the foregoing list it can be seen that the green post-ocular stripe, which features as a prominent part of the head colouring of some species of *Anas*, is also present to varying degrees in other species, and may appear in hybrids where it is not apparent in either parent species. This tendency for hybrid ducks to show facial patterns differing from those of the parents

but similar to the pattern found in other species has been described by J. M. Harrison (1945, 1953) and by Sage (1960) with reference to the ''bimaculated'' facial patterns. The phenomenon has been termed ''reverse mutation''.

The occurrence of the green stripe in some fo these hybrids might be explained if we assume that *A. platyrhynchos* possesses a green post-ocular stripe which is concealed by virtue of the fact that the remainder of the head plumage is of the same colour. This might also be true in the case of the Shoveler, *A. clypeata*. The stripe has a signal function in the epigamic displays. Lorenz (1955) has described the ''head-turning'' posture which occurs in many species of Anatinae, in which the drakes turn the back of the head towards the female, partially erecting the feathers, so that a distinctive pattern is presented to her. The post-ocular stripe plays an important part in forming this pattern. It is significant that in the case of *A. platyrhynchos* the feathers of the nape and the back of the head are erected, appearing black to the duck, while those of the sides of the head are sleeked down so that a distinct green stripe is then visible in that part of the plumage where the post-ocular stripe would occur. It is also signfiicant in view of the display function, that the green iridescence on the heads of the males of *A. acuta*, *A. discors*, and *A. rhynchotis*, is only visible when viewed from behind.

CAIRININI

Carolina Duck, *Aix sponsa*, (♂) In this species most of the head is iridescent. There is a distinct tract of feathers marking the post-ocular stripe which is purple near the eye, but otherwise green.

Mandarin Duck, *Aix galericulata*, (♂) There is a distinct green stripe, partly obscured by a creamy supra-orbital stripe which also encircles the eye.

Muscovy Duck, *Cairina moschata*, (♂) Iridescent green on the black head-feathers is only visible in some lights, but is more marked in the post-ocular region and less apparent on the crown.

Green Pygmy Goose, *Nettapus pulchellus*, (♂) The sides and back of the neck are dark glossy green and there is green iridescence on the feathers of the nape and the post-ocular region.

African Pygmy Goose, *Nettapus auritus*, (♂) Crown and nape are dark glossy green. The sides of the head are white, but there is a large patch of glossless pale green feathers bordered with black on each side of the neck posterior to the ear-coverts.

Hybrids

Carolina Duck x Gadwall, *Aix sponsa* x *Anas strepera*, (B. M. 1913.4.5.1) ear-coverts light brown, post-ocular stripe and crown entirely iridescent green, nape and neck purplish black.

Carolina Duck x Pintail, *Aix sponsa* x *Anas acuta*, (B. M. 1891.8.25.1.) head mainly dark with green and purple sheen. Cheeks and throat with many pale greyish feathers. A clear green post-ocular stripe present.

Another specimen (B. M. 1924.5.3.1). Ear-coverts and neck speckled white and brown, crown and post-ocular stripe completely green.

Carolina Duck x Wigeon, *Aix sponsa* x *Anas penelope*, (B. M. 1924.5.31. 123). Throat reddish; ear-coverts speckled black on buff, crown speckled black on brown. Green iridescent nuchal tuft, the green colour extending forwards to just over the eye.

In this tribe the genus *Aix* appears to possess a green stripe homologous with that of the Anatini. It tends, however, to be obscured by other signal plumage and seems not to play any special part in the display of these species. The patterns shown by *Nettapus* present some problems. They appear analogous to the green stripe in that they are signal patterns with similar colours on a similar area of the head plumage, and presumably they have a display function, but, unless one assumes that there is some evidence in the distribution of green plumage in *N. pulchellus*, there is no clear indication as to whether these are homologous or whether they have evolved independently to fulfil similar needs.

AYTHYINI

Hybrids

Tufted Duck x Ferruginous Duck, *Aythya fuligula* x *Aythya nyroca*. Two specimens. One shows a rufous crown and tuft, the rest of the head being glossy green; the other has the same rufous crown and tuft, with the remainder of the head brown save for an ill-defined iridescent green stripe extending back from the eye and broadening to a distinct green area on the nape.

Many of the species in this tribe show green or purple iridescence over most of the head. The fact that hybrids of purple-headed and red-headed species, *e.g. Aythya fuligula* x *Aythya nyroca*, and *Netta peposaca* x *Netta rufina*, show green-glossed heads suggests that the colour of the gloss is related to the underlying pigment. The head of *A. fuligula* is mainly purple with a greenish gloss only visible in some lights. The reduction of the gloss to a green stripe in the post-ocular region in one of the hybrids suggests that the genetic potential for such a stripe may persist in the inheritance of these species.

MERGINI

Bufflehead, *Bucephala albeola*, (♂) Gloss of the head is mainly purple and the large white patch behind the eye masks most of the area where the stripe would otherwise be, but a bright glossy green area extends from this white patch to the nape and the loral region has a dark green gloss.

Smew, *Mergus albellus*, (♂) The head is mainly white but there is a dark green glossy stripe arising a little behind the eye and extending to the nape where the two stripes unite to form a dark nuchal tuft.

In the genera *Mergus* and *Bucephala* the conspicuous signal plumage of the head consists of crests and white patches. The presence of an apparent green stripe in two species does suggest that this pattern may be shared by this tribe, and since a number of species in these genera have green-glossed heads the possible presence of concealed green stripes cannot be ruled out.

SOMATERIINI

Common Eider, *Somateria mollissima*, (♂) There is a pale, non-glossy green stripe in the post-ocular region, although the area immediately behind the eye is covered by part of the black cap. There is also a pale

green patch on the side of the head which appears to be part of the same area of coloured plumage that includes the stripe, but is separated from it by a white line.

Steller's Eider, *Polysticta stelleri*, (♂) Head is mainly white with a tuft of non-glossy pale green feathers on the nape, and a paler area on the forehead.

The Eiders present a problem similar to that shown by *Nettapus*. In each case there is an area of pale non-glossy green feathers present on the head in a similar region to the post-ocular stripe but more extensive in area. This plumage is, in the case of the Eiders, undoubtedly analogous to the stripe, being used in a head-turning display, but it is not possible to be sure of its homology. The Spectacled Eider, *Somateria fischeri*, has in the males a similar green colour over most of the head. The fact that this type of colouring occurs in two different tribes does suggest that it may represent a form of the green stripe, and that the difference in colour may be due to a simple factor such as appears to control the green and purple glosses. It seems more likely that there is homology here rather than that the patterns of *Nettapus* and the Somateriini should have arisen from independent evolution of similar signal markings within a related group. It is probable that the conspicuous and well-formed stripe apparent in *Anas formosa*, for example, is a variant of the basic green stripe as elaborate and highly evolved as the green markings on the head of *Somateria mollissima*.

DISCUSSION

From this list of species in which it occurs it can be seen that the existence of green-glossed feathers in the post-ocular region of the head is more widespread than might be supposed from a superficial examination of the character. It has been assumed here that where plumage of a similar colour occurs at a similar place on the body in different species which are considered to have a common genetic origin, this plumage is produced by related genes. The green stripe is conspicuous and usually confined to males, and has a function in the epigamic displays. It is most apparent and most elaborate in the Anatini, where it plays an important part in displays, In *Aix* it is present but partially obscured by other plumage patterns used in display, and it may reasonably be suspected that it precedes the latter patterns as a signal plumage. The same might be true in the Mergini. Its appearance in a hybrid of the Aythyini suggests that it is a part of the genetic inheritance of this tribe, but there is no evidence that it has ever been phenotypically apparent. The markings in *Nettapus* and the Somateriini could be regarded as a divergent evolution of signal markings from the same character.

The green post-ocular stripe, as a plumage character of the Anatinae, appears to show a distribution similar to that of plumage characters studied in other groups, and also to the bimaculated pattern as discussed in the study of estrildine plumage patterns (Harrison, C. J. O. 1960, and in press). It is apparently present as part of the genetic inheritance of most, if not all, of the subfamily, but is only phenotypically apparent in the plumage of some genera. In some species it is not apparent; in some it is present in a simple, inconspicuous form; in others it has been evolved into a more elaborate form to play a conspicuous part in the display plumage

and to help form the patterns which aid specific recognition. In others again it is present but partly obliterated by other patterns used in epigamic display; and there seems to be evidence that secondary loss may occur, as is suggested by hybrids of *A. platyrhynchos* and *A. penelope* which seem to show that in these species areas of conspicuous uniform coloration may occur at a later stage in the evolution of plumage pattern, resulting in a loss of the components of the more complex patterns. There is a parallel to the latter in some estrildine species where a spread of uniform coloration can be seen to be obliterating or suppressing patterned plumage.

The study of estrildine patterns also reveals that where birds of the same widely dispersed family have a common inheritance of plumage pattern, such patterns show only limited variation; and, where there is pressure for the evolution of new patterns, such patterns will tend to evolve along similar lines showing convergence at their various stages. It is possible for allopatric species which are not immediately related to evolve very similar patterns. In *Anas*, *A. discors* and *A. rhynchotis* may furnish examples of this, each showing the crescentic white patch on the head, and the bluish gloss with the concealed green stripe, yet each possibly evolved independently on the separate continents.

From the evidence of variants and hybrids (see also Harrison, J. 1945, 1953, 1959) it would appear that *Anas platyrhynchos*, *A. crecca*, and *A. formosa*, may have had an ancestral head pattern showing both the bi-maculated pattern and the green post-ocular stripe in a simple form. In *A. crecca* only the stripe is now apparent and in *A. platyrhynchos* neither is obvious. However, it is inadvisable to conclude that this type of pattern loss gives an indication of direct derivation or of phylogenetic relationship between one species and another. There appears to be a need for variation in plumage patterns in order to ensure specific recognition, and it is likely that the facial patterns of *A. platyrhynchos*, *A. crecca*, and *A. formosa* represent equal divergence and elaboration of a common basic pattern, resulting in specific identity. Since the genetic existence of such patterns does not necessarily result in their phenotypical appearance in the plumage of the species we cannot definitely conclude that the evidence which we possess proves that there is any closer relationship between these three species than that implied by their generic grouping with other species.

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